US009272398B2

(12) **United States Patent**
Keller et al.

(10) **Patent No.: US 9,272,398 B2**
(45) **Date of Patent: Mar. 1, 2016**

(54) **HAND MACHINE TOOL**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 683 days.

(21) Appl. No.: **13/584,237**

(22) Filed: **Aug. 13, 2012**

(65) **Prior Publication Data**

US 2013/0048460 A1 Feb. 28, 2013

(30) **Foreign Application Priority Data**

Aug. 11, 2011 (DE) 10 2011 080 800

(51) **Int. Cl.**
B23Q 5/00 (2006.01)
B25B 21/00 (2006.01)
B25B 23/14 (2006.01)

(52) **U.S. Cl.**
CPC ***B25B 21/00*** (2013.01); ***B25B 23/141*** (2013.01)

(58) **Field of Classification Search**
CPC B25B 21/00; B25B 23/141
USPC 173/176, 1, 5, 7, 179, 180
See application file for complete search history.

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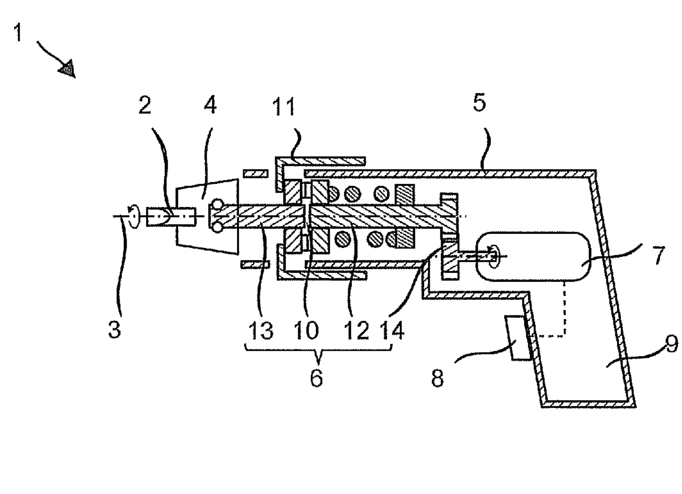
(57) **ABSTRACT**

A hand machine tool includes a tool retainer that retains a tool, a motor that drives the tool retainer in a rotary motion, and a torque-controlled sliding clutch that is connected in a drivetrain between the motor and the tool retainer. The sliding clutch includes a first clutch disk, a second clutch disk, a spring and a controlling unit which can be activated manually. The second clutch disk is arranged displaceably alongside an axis limited by a stop in the direction toward the first clutch disk. Force is applied to the second clutch disk by the spring alongside the axis in the direction toward the first clutch disk. The manually activated controlling unit variably sets an axial distance between the first clutch disk and the stop, with which an engagement depth of the first clutch disk with the second clutch disk can be defined.

18 Claims, 3 Drawing Sheets



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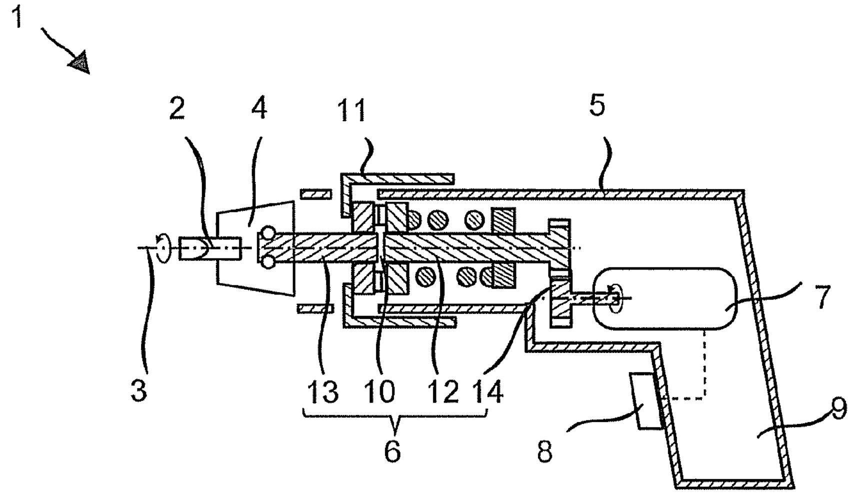
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Fig. 1

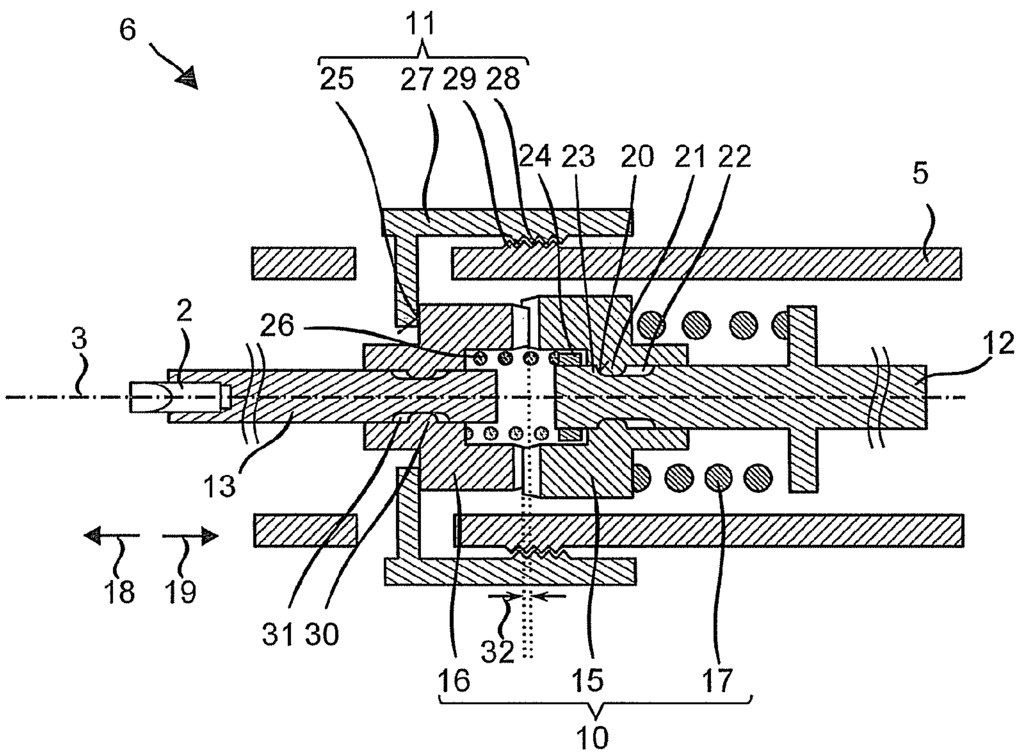
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Fig. 2

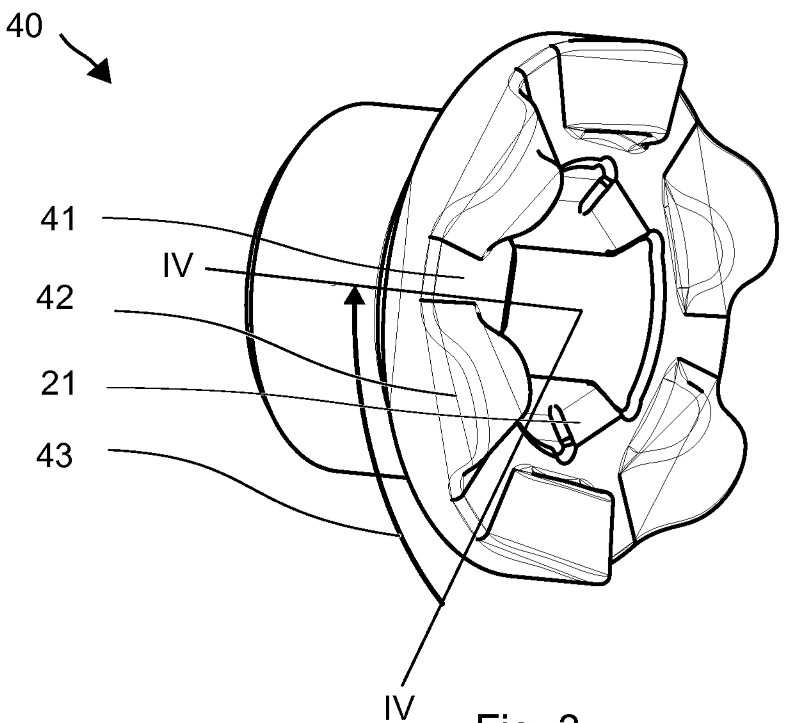

Fig. 3

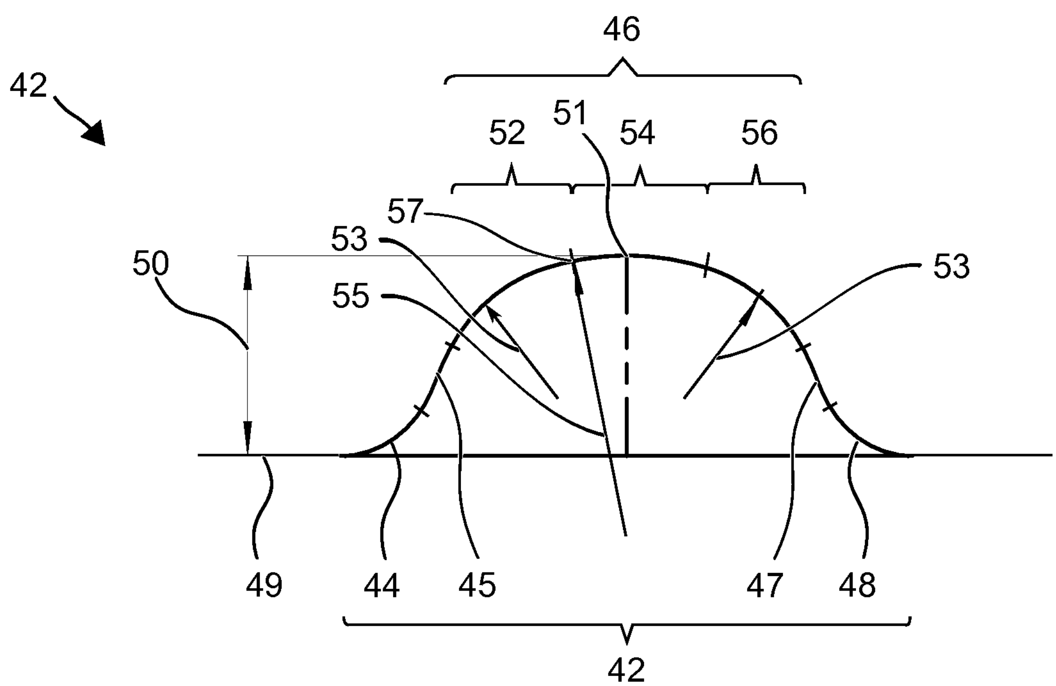

Fig. 4

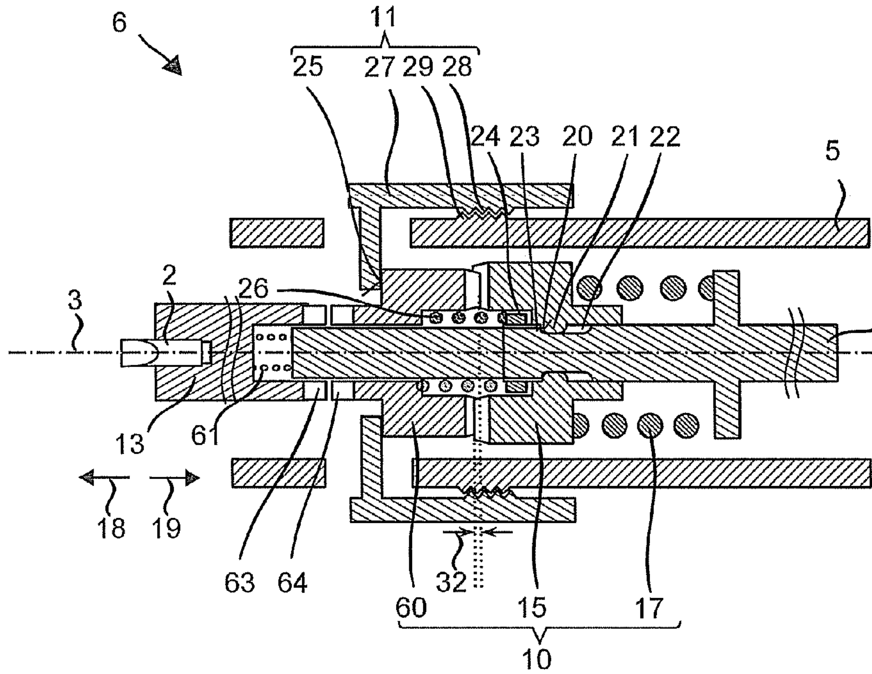
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Fig. 5

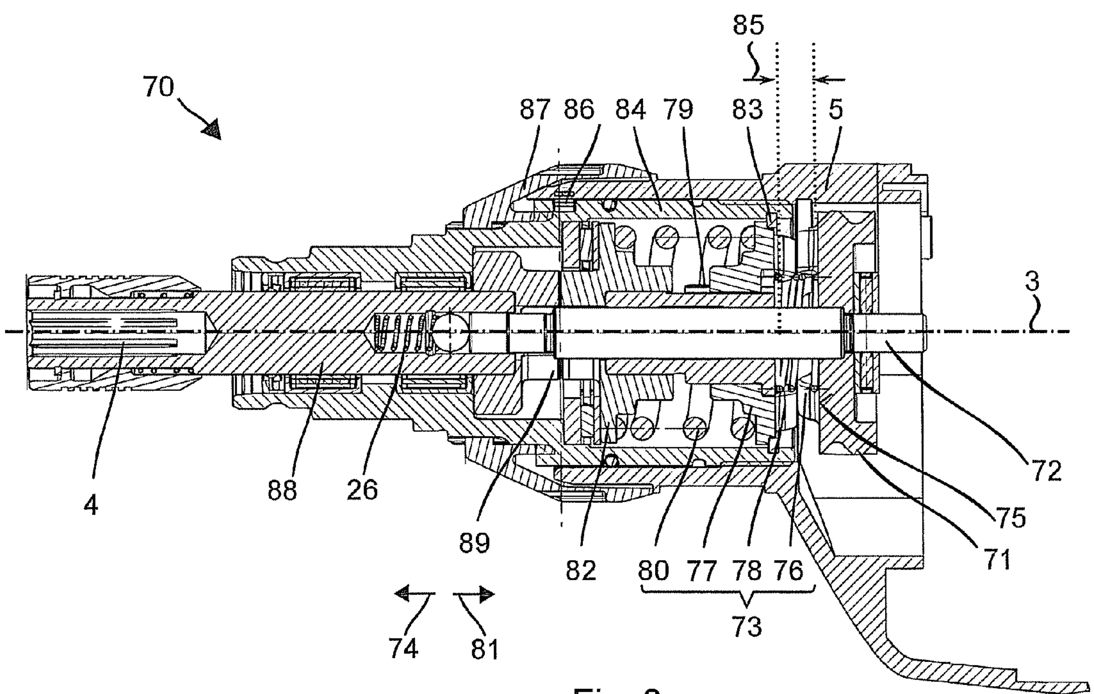
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Fig. 6

HAND MACHINE TOOL

CROSS-REFERENCE TO RELATED APPLICATIONS

The present application claims priority to German Patent Application No. DE 10 2011 080 800.0, filed Aug. 11, 2011, which is hereby incorporated by reference herein in its entirety.

FIELD OF THE INVENTION

Some embodiments of the present invention relate to a hand machine tool and, in particular, to an electric screw driver.

BRIEF SUMMARY OF THE INVENTION

The hand machine tool according to some embodiments includes a tool retainer that retains a tool, a motor that drives the tool retainer in a rotary motion, and a torque-controlled sliding clutch that is connected in a drivetrain between the motor and the tool retainer. The sliding clutch includes a first clutch disk, a second clutch disk, a spring, and a controlling unit which can be activated manually. The second clutch disk is displaceably arranged alongside an axis limited by a stop in a direction toward the first clutch disk. Force is applied to the second clutch disk by the spring alongside the axis in the direction toward the first clutch disk. The manually activated controlling unit variably sets an axial distance between the first clutch disk and the stop, with which an engagement depth of the first clutch disk with the second clutch disk can be defined.

In some embodiments, the spring keeps the two clutch disks engaged by default. The stop maintains a distance between the second clutch disk and the first clutch disk. Consequently, the engagement depth of the second clutch disk with the first clutch disk is limited by the stop. If a torque applied to the sliding clutch exceeds a critical limit, the second clutch disk is deflected alongside the axis against the effect of the spring to the point where the two clutch disks are fully disengaged and the torque transmission is interrupted. The limiting value can be set with the engagement depth, which is defined by the relative position of the first clutch disk compared to the stop. As a result, the controlling unit enables the user to set a desired triggering torque.

According to one embodiment, the first clutch disk has cams and the second clutch disk has cams. The clutch disks are engaged with each other via the cams. Each of the cams of at least one of the two clutch disks has a convexly curved top, wherein the radius of curvature of the top increases toward the summit. The cam has a concave base starting from a bottom, for example, having a negative curvature. In some embodiments, a flat side is connected to the base, followed by the convex top with the positive curvature. Alternatively, the convex top can be connected directly to the concave base. The sequence of the structures of a cam is viewed along a circumferential direction and at a constant distance to the axis. The top describes the entire area of a cam with a convex shape. The curvature of the top decreases from the base toward the direction of the summit or peak of the top. Although the grooves can be disadvantageous for other models of a sliding clutch due to their larger widths, they have proven advantageous in the presented configurations according to some embodiments. The decreasing curvature enables a robust setting of a low engagement depth and hence a low limit for triggering the sliding clutch. The mechanism is in particular

robust against tolerances associated with the manufacture and installation of the sliding clutch. Setting high limits with a deep engagement depth is equally possible in some embodiments.

Some embodiments provide that the top includes of a first section and a second section on an ascending side to the summit and the first section includes a first radius of curvature and the second section includes a second radius of curvature in which the first radius of curvature is lower than the second radius of curvature. In some embodiments, the top is designed with two different radii of curvature (e.g., exactly two different radii of curvature). On the descending side, the radius of curvature can decrease again from the larger second radius of curvature to the first radius of curvature. The first radius of curvature is, for example, lower by at least 20% than the second radius of curvature. The second radius of curvature can be between 0.9 and 1.2 times as high as a height of the cam. The height of the cam refers to the maximum dimension of the cam alongside the axis, for example, from the start of the base to the summit of the top.

According to some embodiments, the second clutch disk is arranged movably on a shaft (e.g., an intermediate shaft), and the first clutch disk and the second clutch disk are arranged movably alongside the axis relative to the shaft.

The first clutch disk rests on an additional stop formed by the controlling mechanism displaceable alongside the axis toward a direction facing away from the second clutch disk. The two clutch disks are limited in their axial motion in the same direction by two separate stops. The other stop is displaceable relative to the first stop and the distance between them defines the engagement depth of the two clutch disks.

According to some embodiments, the second clutch disk is interlocked with the shaft for transmitting a torque and the first clutch disk is interlocked with an additional shaft for transmitting a torque in which the first clutch disk is displaceable relative to an additional shaft. The additional shaft is, for example, a spindle which retains a tool or is connected with the tool retainer. An axial mobility of the first clutch disk relative to the other shaft can, for example, be achieved with an interconnected claw clutch.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** shows an electric screw driver.
FIG. **2** shows a drivetrain of the electric screw driver.
FIG. **3** shows a clutch disk.
FIG. **4** shows a clutch disk.
FIG. **5** shows a drivetrain of an electric screw driver.
FIG. **6** shows a drivetrain of an electric screw driver.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** illustrates an exemplary electric screw driver **1** which drives a tool **2**, or example, a screw bit, around a working axis **3** in a rotary motion when in operation. A tool retainer **4** for a tool **2** is arranged on a case **5** and is pivotal around the working axis **3**. The tool retainer **4** is coupled with an electric motor **7** via a drivetrain **6**. The electric motor rotates in response to the operation of a system button **8**. A user can start the electric screw driver **1** by means of the system button **8** and guide it by means of a handle **9** provided on the case **5**.

FIG. **2** illustrates a design of the drivetrain **6** with an adjustable sliding clutch **10**, which interrupts a transmission of a torque if an applied torque exceeds a limiting value. The limiting values can be set by a user by means of a slide **11**. The sliding clutch **10** engages with a countershaft **12** on the side of the drivetrain and with an output spindle **13** on the output side, which are both coaxial to the working axis **3**. The countershaft **12** is arranged axially stationary in the case **5**. The countershaft **12** is, for example, driven with a transmission **14**, here illustrated with two pinions as an example, which is connected torque-resistant with the electric motor **7**. The output spindle **13** is provided with the tool retainer **4** on a frontal end. The illustrated design of the drivetrain **6** is exemplary and may contain additional transducing or power-interrupting components in other embodiments.

The slide clutch **10** includes a clutch disk **15** on the drive side, a clutch disk **16** on the output side and a pull-back spring **17**. The clutch disk **15** on the drive side is arranged axially moveable on the countershaft **12**. The clutch disk **15** on the drive side can approach the clutch disk **16** on the output side alongside the working axis **3** in the engagement direction **18** or distance itself from the clutch disk **16** on the output side in the release direction **19** (e.g., in the opposite direction of the engagement direction **18**). The pull-back spring **17** acts on the clutch disk **15** on the drive side in the engagement direction **18**, pushing it toward the clutch disk **16** on the output side in the engagement direction **18**. In a basic position of the slide clutch **10**, for example, without applied torque, the clutch disk **15** on the drive side is as close to the clutch disk **16** on the output side as possible. In the basic position, the clutch disks **15**, **16**—designed, for example, in the form of cam rings—are engaged, whereby the clutch disk **15** on the drive side transmits an applied torque to the clutch disk **16** on the output side. One shape of the cam rings is designed in such a way that a force acting in the release direction **19** is exerted onto the clutch disk **15** on the drive side if a torque is applied. If the applied torque exceeds the limiting value, then the force is sufficiently released at the clutch disk **15** on the drive side against the force of the pull-back spring **17** in the release direction **19** to the point where the cam rings are completely disengaged.

A first stop **20** limits a movement of the clutch disk **15** on the drive side toward the engagement direction **18** in that the clutch disk **15** on the drive side comes to rest on this first stop **20** in the engagement direction **18**. The first stop **20** is arranged alongside an axial line between the clutch disk **15** on the drive side and the clutch disk **16** on the output side. The first stop **20** is axially stationary relative to the case **5** and the countershaft **12**. Consequently, the first stop **20** determines the relative axial position of the clutch disk **15** on the drive side compared to the clutch disk **16** on the output side in the basic position. In FIG. **2**, the clutch disk **15** on the drive side has at least one radially protruding peg **21**, which engages with an axially running longitudinal groove **22** in the countershaft **12**. The longitudinal groove **22** is closed on one end of the groove **23** in the engagement direction **18**. The end of the groove **23** forms the first stop **20** and the peg **21** forms an interlock for the torsionally rigid coupling of the clutch disk **15** on the drive side with the countershaft **12** for the transmission of a torque. The interlock can include a plurality of longitudinal grooves **22** and pegs **21**. The first stop **20** can alternatively or additionally be formed with a ring **24** placed onto the countershaft **12**. The ring **24** is placed onto an end of the countershaft **12** pointing into the engagement direction **18**.

The clutch disk **16** on the output side is arranged movable relative to the countershaft **12**. Referring to FIG. **2**, the clutch disk **16** on the output side is axially arranged movably on the output spindle **13**. A second stop **25** limits the motion of the clutch disk **16** on the output side in the engagement direction **18**. The directions are always quoted with respect to the motion of the clutch disk **15** on the drive side. If a torque is applied, the clutch disk **16** on the output side touches the second stop **25**. The shape of the grooves results in a partial conversion of the torque into a force acting on the clutch disk **16** on the output side in the engagement direction **18**. An optional spring **26** can be provided to retain the clutch disk **16** on the output side on the second stop **25**. The spring **26** acts on the clutch disk **16** on the output side in the engagement direction **18** and is braced, for example, on the countershaft **12**.

The second stop **25** is connected with the slide **11**. The slide **11** has a runner **27** which is, for example, placed onto the case **5** and can be rotated relative to the case **5**. The runner is provided for the user to grasp. A thread **28** on the runner **27** oriented alongside the working axis **3** engages with a corresponding thread **29** of the case **5**. When the runner **27** is turned, the runner **27** is displaced relative to the case **29** and the countershaft **12** alongside the working axis **3**. The second stop **25** is a ring protruding inward formed on the runner **27**.

The clutch disk **16** on the drive side has, for example, one or a plurality of pegs **30** pointing inward, which engage with grooves **31** in the output spindle **13** for transmitting a torque.

The first stop **20** and the second stop **25** define an axial distance between the clutch disk **15** on the drive side and the clutch disk **16** on the output side and hence a depth **32** of engagement in the basic position. Starting from the basic position, the engagement depth **32** corresponds to the deflection of the clutch disk **15** on the drive side in the release direction **19** which releases the sliding clutch **10**. The torque used to release the sliding clutch **10** increases with increasing engagement depth **32**, amongst other things, because of the spring power of the pull-back spring **17** increasing progressively as a result of the deflection. The user can set the limiting value for the transmitted torque by axially displacing the second stop **25**.

FIG. **3** shows an exemplary clutch disk **40** on the drive side in a perspective representation, with a view of a frontal area **41** pointing toward the engagement direction **19**. FIG. **4** shows a section of an unrolled profile of the clutch disk **40** in which the cut out section is indicated as cylindrical area IV-IV in FIG. **3**. The clutch disk **40** has a plurality of cams **42** (e.g., uniform cams) on the frontal area **41**. A clutch disk on the output side can be provided with identical cams as those of the clutch disk **40** on the drive side. The cams **42** are arranged successively in the circumferential direction **43** around the working axis **3**. Arranged successively in the circumferential direction **43**, the cam **42** has a front base **44**, a flank **45** rising in the engagement direction **19**, a top **46**, a flank **47** sloping down in the engagement direction **19** and a back base **48**. The clutch disk **40** can include a flat bottom **49** between two successive cams **42**.

During an engagement of the clutch disk **40** on the drive side with the clutch disk on the output side, the respective rising flanks **45** extensively rest on each other. The rising flank **45** and the falling flank **47** are flat for this purpose according to some embodiments. An incline of the flanks **45**, **47** relative to the working axis **3** ranges, for example, between 45 degrees and 70 degrees. The incline defines the conversion of the applied torque into an axially acting force. The flank **45** covers a ratio of 20% to 30% of a height **50** of the cam **42**. The slide **11** makes it possible to define the engagement depth **32**. If the engagement depth **32** is deeper, the rising flanks **45** of the two clutch disks are completely resting on each other across the entire height.

In some embodiments, the base **44** has a negative curvature with a constant radius of curvature from the bottom **49** to the flank **45**. A transition from the bottom **49** to the base **44** is smooth, i.e., provided with a gradually rising incline without any jumps. Similarly, a transition between the base **44** and the flank **45** is smooth. In some embodiments, a radius of curvature of the base **44** is considerably smaller than the height **50** of the cam **42**, e.g., smaller than 40% of the height **50**. The ratio of the base **44** on the height **50** of the cam **42** can therefore be kept low.

The top **46** has a continuous positive curvature, which includes at least two radii of curvature in the rise from the rising flank **45** to a summit **51** of the top **46**. The flank **45** transitions smoothly into a first section **52** of the top **46**. The first section **52** has a first radius of curvature **53** and transitions smoothly into a second section **54** with a second radius of curvature **55**. The summit **51** of the top **46** is located in the second section **54**. The exemplary top **46** is symmetrical to the summit **51**, and a third section **56** with a radius of curvature identical to the first radius of curvature **53** is connected to the second section **54**.

The first radius of curvature **53** is lower than the second radius of curvature **55**, in some embodiments by at least 20%, and by at most 60% lower than the second radius of curvature **55**. The first section **52** has the strongest local curvature (lowest radius of curvature) between the flat flank **45** and the summit **51** of the cam **42**. A length, measured in the unrolling direction, of the cam **42** is 20% to 40% longer because the middle second section **54** is less curved than a cam whose top is designed with a cylindrical top and the second radius of curvature. A ratio of height **50** of the cam **42** and the second radius of curvature **55** is within the range of 0.5 and 0.75. The first radius of curvature **53** is nearly identical to the height **50**, their ratio ranging between 0.9 and 1.2, for example. The top **46** has a ratio of more than 50% of the height **50** of the cam **42**. A point of transition **57** from the first area **52** to the second area **54** is located at about 90% to 95% of the height **50** of the cam **42**. If the user sets the slide **11** to a minimum torque, the second clutch disk only engages with the first clutch disk to the point of transition **57**, while the first section **54** remains untouched.

FIG. **5** shows an additional embodiment of the drivetrain **6**. The clutch disk **15** on the drive side is designed essentially identical to the previous embodiment and arranged axially movable and interlocking in the direction of rotation on the countershaft **12**. A clutch disk **60** on the drive side is arranged axially movable on the countershaft **12** and can rotate freely relative to the countershaft **12**. The clutch disk **15** on the drive side and the clutch disk **60** on the output side are engaged by means of cams **42**, as described above. The axial distance between the clutch disk **15** on the drive side and the clutch disk **60** on the output side in the basic position is defined for the clutch disk **60** on the drive side by the stop **25** positioned by the slide **11**.

The spindle **13** is axially moveable relative to the countershaft **12**. A spring **62** between the spindle **13** and the countershaft **12** keeps them at a distance in the basic position. The spindle **13** includes axially protruding claws **63** in the direction toward the countershaft **12**. The claws are able to engage with corresponding claws **64** on the clutch disk **60** on the output side. The claw clutch formed with the claws **63**, **64** can be part of a mechanical activation of the spindle **13**. In some embodiments, the engagement only takes place when a user pushes the spindle **13** against the countershaft **12**.

FIG. **6** shows an additional embodiment of a drivetrain **70**. The drivetrain **70** has a motor-activated pinion **71** and a countershaft **72** which are coupled by way of a torque-controlled clutch **73**. The pinion **71** is arranged pivotally on the countershaft **72**. A drive pinion (not illustrated) combs with the pinion **71**. The pinion **71** includes cams **76** on its frontal side **75** pointing in the direction **74** toward the tool retainer **4** and designed as clutch disk on the drive side. The pinion **71** is stationary inside the case **5** alongside the working axis **3**. A clutch disk **77** on the output side engaging with the clutch disk on the drive side is axially movably arranged on the countershaft **72**. Cams **76** of the clutch disk **71** on the drive side and cams **78** of the clutch disk **77** on the output side can be designed identical to the cams of the embodiments described above. The clutch disk **77** on the drive side is torsionally rigidly coupled with the countershaft **72** via internal interlocking **79**.

A pull-back spring **80** pushes the movable clutch disk **77** on the drive side toward the clutch disk **71** on the output side in the readjustment direction **81**, in order to keep it engaged in a basic position. The pull-back spring **80** is braced on a ring **82** against the readjustment direction **81**. The ring **82** is mounted on the countershaft **72** axially stationary. In some embodiments, the ring **82** turns together with the countershaft **72**, in order to prevent a torsion of the pull-back spring **80**. In the basic position, the clutch disk **77** on the drive side rests on a stop **83** in the readjustment direction **81**. The stop is axially connected rigidly with a runner **84** surrounding the clutch disk **77** on the output side. The stop **83** is realized, for example, with a spring ring, which overlaps with the clutch disk **77** on the output side in radial direction. A distance **85** of the stop **83** from the clutch disk **71** on the drive side defines how far the cams **76**, **78** are allowed to engage maximally with each other, for example, in the basic position. The runner **84** and hence the stop **83** can be displaced at different settings alongside the working axis **3** relative to the countershaft **72** and the clutch disk **71** on the drive side. A helicoidally connecting link **86** on a set collar **87**, which the user can grasp, engages with the runner **84** and defines its axial position relative to the case **5**.

An output shaft **88** is axially moveable relative to the countershaft **72** and engages with the countershaft **72** via a claw clutch **89**. The ring **82** mounted on the countershaft is designed as a part of the claw clutch **89**. Alternatively, the driveshaft **87** can be connected rigidly with the countershaft **72**.

The invention claimed is:

1. In a hand machine tool that includes a tool retainer that retains a tool, a motor that drives the tool retainer in a rotary motion, and a torque-controlled clutch that is connected in a drivetrain between the motor and the tool retainer, the torque-controlled clutch comprising:

a first clutch disk comprising a plurality of first cams that project from a frontal area of the first clutch disk;

a second clutch disk comprising a plurality of second cams that project from a frontal area of the second clutch disk and engage the plurality of first cams of the first clutch disk;

a spring configured to apply a force to the second clutch disk in a readjustment direction relative to the first clutch disk, wherein the second clutch disk is displaceably arranged alongside an axis parallel to the readjustment direction and toward the readjustment direction limited by a stop; and

a controlling unit that stipulates an axial distance between the first clutch disk and the stop to define an engagement depth of the plurality of first cams of the first clutch disk with respect to the plurality of second cams of the second clutch disk,

wherein each of the plurality of first cams or each of the plurality of second cams include a convexly curved top,

wherein each convexly curved top includes a radius of curvature that is increasing toward a summit, wherein the top includes a first section and a second section,

wherein the first section extends on a rising side to the summit,

wherein the first section includes a first radius of curvature,

wherein the second section includes a second radius of curvature, and

wherein the first radius of curvature is lower than the second radius of curvature.

2. The torque-controlled clutch according to claim **1**, wherein the first clutch disk and the second clutch disk are movably arranged alongside the axis relative to a first shaft.

3. The torque-controlled clutch according to claim **2**, wherein the first clutch disk rests on a second stop that is displaceable alongside the axis and that is formed by the controlling unit in a direction facing away from the second clutch disk.

4. The torque-controlled clutch according to claim **3**, wherein the second clutch disk is interlocked with the first shaft that transmits a torque, wherein the first clutch disk is interlocked with a second shaft that transmits the torque, and wherein the first clutch disk is moveable relative to the second shaft.

5. The torque-controlled clutch according to claim **4**, wherein the first clutch disk is arranged on the first shaft and coupled with the second shaft via a claw clutch.

6. The torque-controlled clutch according to claim **2**, wherein the second clutch disk is interlocked with the first shaft that transmits a torque, wherein the first clutch disk is interlocked with a second shaft that transmits the torque, and wherein the first clutch disk is moveable relative to the second shaft.

7. The torque-controlled clutch according to claim **6**, wherein the first clutch disk is arranged on the first shaft and coupled with the second shaft via a claw clutch.

8. The torque-controlled clutch according to claim **1**, wherein the first radius of curvature is at least 20% smaller than the second radius of curvature.

9. The torque-controlled clutch according to claim **8**, wherein that the second radius of curvature is between 0.9 to 1.2 times as much as a height of the cam.

10. The torque-controlled clutch according to claim **9**, wherein at one of the first cams includes a flat rising flank to which the first section of the top is connected.

11. The torque-controlled clutch according to claim **1**, wherein that the second radius of curvature is between 0.9 to 1.2 times as much as a height of the cam.

12. The torque-controlled clutch according to claim **1**, wherein at one of the first cams includes a flat rising flank to which the first section of the top is connected.

13. The torque-controlled clutch according to claim **1**, wherein the controlling unit includes a slide that moves relative to a housing of the hand machine tool, and wherein an inside surface of the slide provides a second stop.

14. The torque-controlled clutch according to claim **1**, wherein the tool includes a screw bit.

15. The torque-controlled clutch according to claim **1**, wherein the second clutch disk is interlocked with a countershaft that transmits torque from the motor, wherein the first clutch disk is interlocked with an output spindle that transmits the torque.

16. In a hand machine tool that includes a tool retainer that retains a tool, a motor that drives the tool retainer in a rotary motion, and a torque-controlled clutch that is connected in a drivetrain between the motor and the tool retainer, the torque-controlled clutch comprising:

a first clutch disk comprising a plurality of first cams that project from a frontal area of the first clutch disk;

a second clutch disk comprising a plurality of second cams that project from a frontal area of the second clutch disk and engage the plurality of first cams of the first clutch disk;

a spring configured to apply a force to the second clutch disk in a readjustment direction relative to the first clutch disk, wherein the second clutch disk is displaceably arranged alongside an axis parallel to the readjustment direction and toward the readjustment direction limited by a stop; and

a controlling unit that stipulates an axial distance between the first clutch disk and the stop to define an engagement depth of the plurality of first cams of the first clutch disk with respect to the plurality of second cams of the second clutch disk,

wherein each of the plurality of first cams or each of the plurality of second cams include a convexly curved top,

wherein each convexly curved top includes a radius of curvature that is increasing toward a summit,

wherein the second clutch disk is interlocked with a countershaft that transmits torque from the motor, wherein the first clutch disk is interlocked with an output spindle that transmits the torque,

wherein the countershaft has a longitudinal groove in which resides a protruding peg of the second clutch disk, and

wherein the protruding peg can move at least axially in the longitudinal groove.

17. The torque-controlled clutch according to claim **16**, wherein the second clutch disk can be limited in an axial direction due to limited movement of the protruding peg in the longitudinal groove.

18. In a hand machine tool that includes a tool retainer that retains a tool, a motor that drives the tool retainer in a rotary motion, and a torque-controlled clutch that is connected in a drivetrain between the motor and the tool retainer, the torque-controlled clutch comprising:

a first clutch disk comprising a plurality of first cams that project from a frontal area of the first clutch disk;

a second clutch disk comprising a plurality of second cams that project from a frontal area of the second clutch disk and engage the plurality of first cams of the first clutch disk;

a spring configured to apply a force to the second clutch disk in a readjustment direction relative to the first clutch disk, wherein the second clutch disk is displaceably arranged alongside an axis parallel to the readjustment direction and toward the readjustment direction limited by a stop; and

a controlling unit that stipulates an axial distance between the first clutch disk and the stop to define an engagement depth of the plurality of first cams of the first clutch disk with respect to the plurality of second cams of the second clutch disk,

wherein each of the plurality of first cams or each of the plurality of second cams include a convexly curved top,

wherein each convexly curved top includes a radius of curvature that is increasing toward a summit,

wherein the second clutch disk is interlocked with a countershaft that transmits torque from the motor, wherein the first clutch disk is interlocked with an output spindle that transmits the torque,

wherein the output spindle has a longitudinal groove in which resides a protruding peg of the first clutch disk, wherein the protruding peg can move at least axially in the longitudinal groove, and

wherein the first clutch disk can be limited in an axial direction due to limited movement of the protruding peg in the longitudinal groove.

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